CLAIMS

What is claimed is:

1. An interference suppression method for use in a wireless communication receiver, the method comprising:

receiving one or more interfering signals along with receiving a desired signal;

generating one or more interference hypotheses for the interfering signals based on hypothesized combinations of known signal sequences and relative signal delays; and

testing the one or more interference hypotheses to identify one or more dominant interferers from among the interfering signals.

2. The method of claim 1, wherein generating one or more interference hypotheses for the interfering signals based on hypothesized combinations of known signal sequences and relative signal delays comprises generating hypothesized interferers based on known training sequences taken at one or more hypothesized delays.

3. The method of claim 2, further comprising receiving information from an associated communication network that identifies particular ones in a defined set of known training sequences that are being used in potentially interfering signals being transmitted by the network in or around a same area as the receiver, and limiting a training sequence search space associated with generation of the interference hypotheses to those particular known training sequences.

4. The method of claim 1, further comprising limiting a delay search space associated with generating the one or more interference hypotheses by assuming that all interfering signals lag the desired signal.

5. The method of claim 1, wherein receiving one or more interfering signals along with receiving a desired signal comprises receiving the interfering and desired signals on one or more receive antennas.

6. The method of claim 1, further comprising considering adjacent channel interference by hypothesizing one or more channel frequency offsets, such that at least one of the one or more interference hypotheses comprises a hypothesized combination of channel frequency offset, known signal sequence, and relative signal delay.

7. The method of claim 6, wherein testing the one or more interference hypotheses to identify one or more dominant interferers from among the interfering signals comprises performing joint channel estimations for the desired signal and the interference hypotheses, and further comprising applying a rotation factor as needed to account for hypothesized channel frequency offsets during joint channel estimations.

8. The method of claim 1, further comprising considering one or more different modulation formats by hypothesizing at least one modulation format different than a modulation format of the desired signal, such that at least one of the one or more interference hypotheses comprises a hypothesized combination of modulation format, known signal sequence, and relative signal delay.

9. The method of claim 8, wherein testing the one or more interference hypotheses to identify one or more dominant interferers from among the interfering signals comprises performing joint channel estimations for the desired signal and the interference hypotheses, and further comprising applying a rotation factor as needed to account for hypothesized modulation formats during joint channel estimations.

10. The method of claim 1, wherein testing the one or more interference hypotheses to identify one or more dominant interferers from among the interfering signals comprises jointly estimating channel models for the desired signal and the one or more hypothesized interferers and evaluating results of the joint estimations.

11. The method of claim 1, wherein testing the one or more interference hypotheses to identify one or more dominant interferers from among the interfering signals comprises performing joint synchronization and channel estimation for the desired signal and the one or more hypothesized interferers and evaluating results of the joint synchronization and channel estimation.

12. The method of claim 11, wherein performing joint synchronization and channel estimation for the desired signal and one or more hypothesized interferers comprises performing Joint Least Squares (JLS) estimations using the desired signal and the one or more hypothesized interferers.

13. The method of claim 12, further comprising pre-computing one or more Least Squares (LS) matrices for one or more combinations of the desired signal and the hypothesized interferers.

14. The method of claim 11, wherein performing joint synchronization and channel estimation for the desired signal and one or more hypothesized interferers comprises performing Maximum a Posteriori (MAP) estimations using the desired signal and the one or more hypothesized interferers.

15. The method of claim 1, wherein testing the one or more interference hypotheses to identify one or more dominant interferers from among the interfering signals comprises jointly estimating channel models for the desired signal and the one or more hypothesized interferers,

and identifying the one or more dominant interferers based on determining which hypothesized interferers yield the best channel models.

16. The method of claim 15, further comprising generating a whitening filter based on the channel models obtained for the one or more dominant interferers.

17. The method of claim 16, further comprising using the whitening filter to cancel interference from the desired signal.

18. The method of claim 16, wherein the desired signal is a GMSK-modulated TDMA carrier, and further comprising performing interference rejection based on a spatial-temporal whitening filter.

19. The method of claim 16, wherein the desired signal is an 8PSK-modulated TDMA carrier, and further comprising de-rotating the received signal with respect to one or more GMSK-modulated interfering signals before using the whitening filter to cancel interference from the desired signal.

20. The method of claim 16, further comprising generating a whitening filter based on a residual signal obtained by subtracting a reconstructed version of the desired signal from the received signal.

21. The method of claim 16, further comprising generating a whitening filter based on reconstructed interfering signals.

22. The method of claim 1, wherein receiving one or more interfering signals along with rec iving a desir d signal comprises receiving desired and interfering signals in each of one or more communication timeslots.

23. The method of claim 22, wherein generating one or more interference hypotheses for the interfering signals based on hypothesized combinations of known signal sequences and relative signal delays comprises generating the one or more interference hypotheses in each communication timeslot.

24. The method of claim 23, wherein testing the one or more interference hypotheses to identify one or more dominant interferers from among the interfering signals comprises identifying the one or more dominant interferers in each communication timeslot, such that interference can be suppressed on a per timeslot basis.

25. An interference suppression method for use in a wireless communication receiver, the method comprising:

simultaneously receiving desired and interfering signals;

hypothesizing one or more interferers based on known training sequences; and

determining which hypothesized interferers best correspond to actual interference.

26. The method of claim 25, further comprising suppressing interference based on the one or more hypothesized interferers determined to best correspond to the actual interference.

27. The method of claim 25, wherein simultaneously receiving desired and interfering signals comprises receiving a training sequence of the desired signal and receiving at least partially overlapping training sequences of one or more interfering signals.

28. The method of claim 27, wherein hypothesizing one or more interferers based on known training sequences comprises assuming that one or more particular training sequences were received at one or more relative signal delays in conjunction with receiving the training sequence of the desired signal.

29. The method of claim 28, wherein determining which hypothesized interferers best correspond to actual interference comprises identifying which combination or combinations of assumed training sequences and relative signal delays yield a lowest channel model estimation error for the desired signal.

30. The method of claim 25, further comprising hypothesizing one or more interferers further based on assumed adjacent channel frequency offsets.

31. The method of claim 25, further comprising hypothesizing one or more interferers further based on one or more assumed modulation formats different from a modulation format of the desired signal.

32. The method of claim 25, further comprising reducing a search space for hypothesizing the one or more interferers by assuming that all interfering signals received lag the desired signal.

33. The method of claim 25, further comprising reducing a search space for hypothesizing the one or more interferers by assuming hypothesizing interferers based on a reduced number of possible training sequences.

34. The method of claim 33, further comprising determining the reduced number of possible training sequences based on information received from a supporting wireless communication network.

35. The method of claim 34, wherein simultaneously receiving desired and interfering signals comprises receiving desired and interfering signals in each of one or more communication timeslots, and wherein hypothesizing one or more interferers based on known training sequences comprises hypothesizing one or more interferers in each communication timeslot.

36. The method of claim 35, wherein determining which hypothesized interferers best correspond to actual interference comprises determining the best hypothesized interferer or interferers in each communication timeslot.

37. A receiver circuit for use in a wireless communication receiver, the receiver circuit comprising processing logic configured to:

generate one or more interference hypotheses for interfering signals received along with a desired signal based on combinations of known signal sequences and relative signal delays; and

test the one or more interference hypotheses to identify one or more dominant interfering signals.

38. The receiver circuit of claim 37, wherein the receiver circuit generates one or more interference hypotheses for the interfering signals based on combinations of known signal sequences and relative signal delays by generating hypothesized interferers based on known training sequences taken at one or more hypothesized delays.

39. The receiver circuit of claim 38, wherein the receiver circuit is configured to receive information from a supporting communication network that identifies particular ones in a defined set of known training sequences, and limiting a training sequence search space associated with generation of the interference hypotheses to those particular known training sequences.

40. The receiver circuit of claim 37, wherein the receiver circuit is configured to limit a delay search space associated with generating the one or more interference hypotheses by assuming that all interfering signals lag the desired signal.

41. The receiver circuit of claim 37, wherein the receiver circuit is configured to consider adjacent channel interference by hypothesizing one or more channel frequency offsets, such

that at least one of the one or more interference hypotheses comprises a hypothesized combination of channel frequency offset, known signal sequence, and relative signal delay.

42. The receiver circuit of claim 41, wherein the receiver circuit is configured to test the one or more interference hypotheses to identify one or more dominant interferers from among the interfering signals by performing joint channel estimations for the desired signal and the interference hypotheses, and further comprising applying a rotation factor as needed to account for hypothesized channel frequency offsets during joint channel estimations.

43. The receiver circuit of claim 37, wherein the receiver circuit is configured to consider one or more different modulation formats by hypothesizing at least one modulation format different than a modulation format of the desired signal, such that at least one of the one or more interference hypotheses comprises a hypothesized combination of modulation format, known signal sequence, and relative signal delay.

44. The receiver circuit of claim 43, wherein the receiver circuit is configured to test the one or more interference hypotheses to identify one or more dominant interferers from among the interfering signals by performing joint channel estimations for the desired signal and the interference hypotheses, and further by applying a rotation factor as needed to account for hypothesized modulation formats during joint channel estimations.

45. The receiver circuit of claim 37, wherein the receiver circuit is configured to test the one or more interference hypotheses to identify one or more dominant interferers from among the interfering signals by jointly estimating channel models for the desired signal and the one or more hypothesized interferers and evaluating results of the joint estimations.

46. The receiver circuit of claim 37, wherein the receiver circuit is configured to test the one or more interference hypotheses to identify one or more dominant interferers from among the

interfering signals by performing joint synchronization and channel estimation for the desired signal and the one or more hypothesized interferers and evaluating results of the joint synchronization and channel estimation.

47. The receiver circuit of claim 46, wherein the receiver circuit is configured to perform joint synchronization and channel estimation for the desired signal and one or more hypothesized interferers by performing Joint Least Squares (JLS) estimations using the desired signal and the one or more hypothesized interferers.

48. The receiver circuit of claim 47, wherein the receiver circuit is configured to pre-compute one or more Least Squares (LS) matrices for one or more combinations of the desired signal and the hypothesized interferers.

49. The receiver circuit of claim 46, wherein the receiver circuit is configured to perform joint synchronization and channel estimation for the desired signal and one or more hypothesized interferers comprises by Maximum a Posteriori (MAP) estimations using the desired signal and the one or more hypothesized interferers.

50. The receiver circuit of claim 37, wherein the receiver circuit is configured to test the one or more interference hypotheses to identify one or more dominant interferers from among the interfering signals by jointly estimating channel models for the desired signal and the one or more hypothesized interferers, and identifying the one or more dominant interferers based on determining which hypothesized interferers yield the best channel models.

51. The receiver circuit of claim 50, wherein the receiver circuit is configured to generate a whitening filter based on the channel models obtained for the one or more dominant interferers.

52. The receiver circuit of claim 51, wherein the receiver circuit is configured to use the whitening filter to cancel interference from the desired signal.

53. The receiver circuit of claim 51, wherein the desired signal is a GMSK-modulated TDMA carrier, and wherein the receiver circuit is configured to perform Single Antenna Interference Rejection (SAIR) based on the whitening filter.

54. The receiver circuit of claim 51, wherein the desired signal is an 8PSK-modulated TDMA carrier, and wherein the receiver circuit is configured to de-rotate the desired signal with respect to one or more GMSK-modulated interfering signals before using the whitening filter to cancel interference from the desired signal.

55. The receiver circuit of claim 37, wherein the receiver circuit comprises an Application Specific Integrated Circuit (ASIC).

56. The receiver circuit of claim 37, wherein the receiver circuit is configured to generate the one or more interference hypotheses in each of one or more communication timeslots.

57. The receiver circuit of claim 56, wherein the receiver circuit is configured to test the one or more interference hypotheses in each communication timeslot, such that the one or more dominant interfering signals are identified per communication timeslot.

58. A receiver circuit for use in a wireless communication receiver that receives one or more interfering signals along with receiving a desired signal, the receiver circuit comprising:

a hypothesis generator circuit to generate one or more hypothesized interferers based on known training sequences; and

an valuation circuit to determine which hypothesized interferers best correspond to actual interference.

59. The receiver circuit of claim 58, further comprising an interference suppression circuit to suppress interference based on the one or more hypothesized interferers determined to best correspond to the actual interference.

60. The receiver circuit of claim 58, wherein the receiver receives a training sequence of the desired signal and at least partially overlapping training sequences of one or more interfering signals, and wherein the hypothesis generator circuit is configured to generate the one or more hypothesized interferers by assuming that one or more particular training sequences were received at one or more relative signal delays in conjunction with receiving the training sequence of the desired signal.

61. The receiver circuit of claim 60, wherein the evaluation circuit is configured to determine which hypothesized interferers best correspond to actual interference by identifying which combination or combinations of assumed training sequences and relative signal delays yield a lowest channel model estimation error for the desired signal.

62. The receiver circuit of claim 60, wherein the evaluation circuit comprises a joint synchronization and channel estimation circuit that determines which hypothesized interferer yield a lowest channel model estimation error for the desired signal.

63. The receiver circuit of claim 58, wherein the receiver circuit is configured to generate the one or more hypothesized interferers in each of one or more communication timeslots.

64. The receiver circuit of claim 63, wherein the receiver circuit is configured to determine which hypothesized interferers best corresponds to actual interference in each communication timeslot.

65. A computer readable medium storing a computer program for controlling a receiver circuit used in a wireless communication receiver that simultaneously receives desired and interfering signals, the computer program comprising:

program instructions to generate one or more hypothesized interferers based on known training sequences; and

program instructions to determine which hypothesized interferers best correspond to actual interference.

66. The computer readable medium of claim 65, wherein the computer program further comprises program instructions to suppress interference based on the one or more hypothesized interferers determined to best correspond to the actual interference.

67. The computer readable medium of claim 65, wherein the receiver receives a training sequence of the desired signal and at least partially overlapping training sequences of one or more interfering signals, and wherein the program instructions to generate the one or more hypothesized interferers comprise program instructions to assume that one or more particular training sequences were received at one or more relative signal delays in conjunction with receiving the training sequence of the desired signal.

68. The computer readable medium of claim 67, wherein the program instructions to determine which hypothesized interferers best correspond to actual interference comprise program instructions to identify which combination or combinations of assumed training sequences and relative signal delays yield a lowest channel model estimation error for the desired signal.

69. The computer readable medium of claim 68, wherein the program instructions to identify which combination or combinations of assumed training sequences and relative signal delays yield a lowest channel model estimation error for the desired signal comprises program

instructions to perform joint estimation of channel models for the desired signal and the one or more hypothesized interferers, and to evaluate resulting channel model estimation errors for the desired signal.

70. The computer readable medium of claim 65, wherein the program instructions to generate one or more hypothesized interferers based on known training sequences comprise program instructions to generate the one or more hypothesized interferers in each of one or more communication timeslots.

71. The computer readable medium of claim 70, wherein the program instructions to determine which hypothesized interferers best correspond to actual interference comprise program instructions to determine which hypothesized interferers best correspond to actual interference in each communication timeslot.

72. A method of suppressing interference in a wireless communication receiver, the method comprising:

buffering a composite received signal comprising combined desired and interfering signals;

generating an estimated interfering signal by suppressing the desired signal in the composite received signal; and

recovering the desired signal from the composite received signal by canceling the estimated interfering signal from the composite received signal.

73. The method of claim 72, wherein buffering a composite received signal comprises generating and storing baseband samples of an antenna-received signal.

74. The method of claim 72, wherein generating an estimated interfering signal by suppressing the desired signal in the composite received signal comprises:

generating a whitening filter based on known data in the desired signal and on a channel model for the desired signal; and

applying the whitening filter to a copy of the composite received signal.

75. The method of claim 74, wherein generating a whitening filter based on known data in the desired signal and on a channel model for the desired signal comprises:

reconstructing the desired signal over a desired signal training period using a known training sequence and desired signal channel estimates; and

estimating the whitening filter based on the reconstructed desired signal.

76. The method of claim 72, wherein generating an estimated interfering signal by suppressing the desired signal in the composite received signal comprises:

obtaining a filtered signal by applying a whitening filter to the composite received signal, wherein the whitening filter is configured to suppress the desired signal;

detecting interfering data symbols in the filtered signal.

77. The method of claim 76, wherein recovering the desired signal from the composite received signal by canceling the estimated interfering signal from the composite received signal comprises reconstructing the interfering signal using its channel model and the detected data symbols and subtracting the reconstructed interfering signal from the composite received signal.

78. A method of suppressing interference in a wireless communication receiver, the method comprising:

generating received signal samples of a received signal that comprises a combination of desired and interfering signals;

calculating a whitening filter to suppress the desired signal;

generating filtered samples by applying the whitening filter to the received signal samples;

recovering interfering signal data symbols from filtered samples; and

recovering desired signal data symbols by canceling a reconstructed version of the interfering signal from the received signal samples.

79. A mobile terminal for use in a wireless communication network comprising:

a transmitter to transmit signals to the network; and

a receiver to receive signals transmitted by the network;

said receiver comprising a receiver circuit configured to:

generate one or more interference hypotheses for interfering signals received along with a desired signal based on combinations of known signal sequences and relative signal delays; and

test the one or more interference hypotheses to identify one or more dominant interfering signals.

80. The mobile terminal of claim 79, wherein the receiver circuit generates one or more interference hypotheses for the interfering signals received based on combinations of known signal sequences and relative signal delays by generating hypothesized interferers based on known training sequences taken at one or more hypothesized delays.

81. The mobile terminal of claim 80, wherein the receiver circuit is configured to receive information from a supporting communication network that identifies particular ones in a defined set of known training sequences, and limiting a training sequence search space associated with generation of the interference hypotheses to those particular known training sequences.

82. The mobile terminal of claim 79, wherein the receiver circuit is configured to limit a delay search space associated with generating the one or more interference hypotheses by assuming that all interfering signals lag the desired signal.

83. The mobile terminal of claim 79, wherein the receiver circuit is configured to consider adjacent channel interference by hypothesizing one or more channel frequency offsets, such that at least one of the one or more interference hypotheses comprises a hypothesized combination of channel frequency offset, known signal sequenc , and relative signal delay.

84. The mobile terminal of claim 83, wherein the receiver circuit is configured to test the one or more interference hypotheses to identify one or more dominant interferers from among the interfering signals by performing joint channel estimations for the desired signal and the interference hypotheses, and further comprising applying a rotation factor as needed to account for hypothesized channel frequency offsets during joint channel estimations.

85. The mobile terminal of claim 79, wherein the receiver circuit is configured to consider one or more different modulation formats by hypothesizing at least one modulation format different than a modulation format of the desired signal, such that at least one of the one or more interference hypotheses comprises a hypothesized combination of modulation format, known signal sequence, and relative signal delay.

86. The mobile terminal of claim 85, wherein the receiver circuit is configured to test the one or more interference hypotheses to identify one or more dominant interferers from among the interfering signals by performing joint channel estimations for the desired signal and the interference hypotheses, and further by applying a rotation factor as needed to account for hypothesized modulation formats during joint channel estimations.

87. The mobile terminal of claim 79, wherein the receiver circuit is configured to test the one or more interference hypotheses to identify one or more dominant interferers from among the interfering signals by jointly estimating channel models for the desired signal and the one or more hypothesized interferers and evaluating results of the joint estimations.

88. The mobile terminal of claim 79, wherein the receiver circuit is configured to test the one or more interference hypotheses to identify one or more dominant interferers from among the interfering signals by performing joint synchronization and channel estimation for the desired signal and the one or more hypothesized interferers and evaluating results of the joint synchronization and channel estimation.

89. The mobile terminal of claim 88, wherein the receiver circuit is configured to perform joint synchronization and channel estimation for the desired signal and one or more hypothesized interferers by performing Joint Least Squares (JLS) estimations using the desired signal and the one or more hypothesized interferers.

90. The mobile terminal of claim 89, wherein the receiver circuit is configured to pre-compute one or more Least Squares (LS) matrices for one or more combinations of the desired signal and the hypothesized interferers.

91. The mobile terminal of claim 88, wherein the receiver circuit is configured to perform joint synchronization and channel estimation for the desired signal and one or more hypothesized interferers comprises by Maximum a Posteriori (MAP) estimations using the desired signal and the one or more hypothesized interferers.

92. The mobile terminal of claim 79, wherein the receiver circuit is configured to test the one or more interference hypotheses to identify one or more dominant interferers from among the interfering signals by jointly estimating channel models for the desired signal and the one or more hypothesized interferers, and identifying the one or more dominant interferers based on determining which hypothesized interferers yield the best channel models.

93. The mobile terminal of claim 92, wherein the receiver circuit is configured to generate a whitening filter based on the channel models obtained for the one or more dominant interferers.

94. The mobile terminal of claim 93, wherein the receiver circuit is configured to use the whitening filter to cancel interference from the desired signal.

95. The mobile terminal of claim 93, wherein the desired signal is a GMSK-modulated TDMA carrier, and wherein the receiver circuit is configured to perform Single Antenna Interference Rejection (SAIR) based on the whitening filter.

96. The mobile terminal of claim 93, wherein the desired signal is an 8PSK-modulated TDMA carrier, and wherein the receiver circuit is configured to de-rotate the desired signal with respect to one or more GMSK-modulated interfering signals before using the whitening filter to cancel interference from the desired signal.

97. The mobile terminal of claim 79, wherein the receiver circuit is configured to generate the one or more interference hypotheses in each of one or more communication timeslots assigned to the receiver, and to test the one or more interference hypotheses in each communication timeslot, such that the one or more dominant interfering signals are identified in each communication timeslot.

98. A base station for use in a wireless communication network comprising:

a transmitter to transmit signals to mobile terminals; and

a receiver to receive signals transmitted by the mobile terminals;

said receiver comprising a receiver circuit configured to:

generate one or more interference hypotheses for interfering signals received along with a desired signal based on combinations of known signal sequences and relative signal delays; and

test the one or more interference hypotheses to identify one or more dominant interfering signals.

99. The base station of claim 98, wherein the receiver circuit generates one or more interference hypotheses for the interfering signals received based on combinations of known signal sequences and relative signal delays by generating hypothesized interferers based on known training sequences taken at one or more hypothesized delays.